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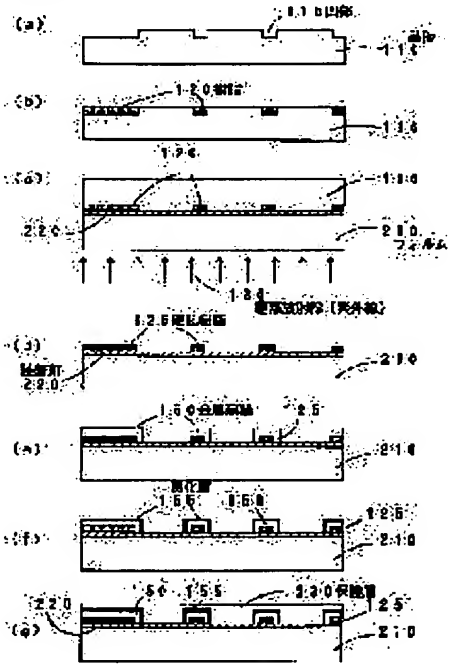
(54) PRODUCTION METHOD FOR ELECTROMAGNETIC WAVE SHIELDING PLATE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a production method for electromagnetic wave shielding plate which is responsive to quality, proper for mass production, and having mesh of metal thin film.
SOLUTION: In a mesh shape recess 115 formed by etching and the like on a substrate surface or a cylinder surface, a resin 120 hardened by ionization radiation or by heat and capable of electroless plating after hardening is embedded. Remaining resin adhered beside the recess is scratched off and the resin is filled in resin filling process. The recess side of the substrate surface of the cylinder surface is pressed to the base material of electromagnetic wave shield plate transparent film 210 in capable of electrolyess plating, ionization radiation 130 is irradiated and resin filling the recess is transferred on the film surface after hardening in transferring process. Electroless plating is applied on the resin part of the transferred film surface in plating process. Thus, on the transparent film surface to be the base material of electromagnetic shield plate, mesh made of metal thin film is formed.



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CLAIMS

[Claim(s)]
[Claim 1] The electromagnetic wave shield which is placed and used for the front face of a display and which has the electromagnetic wave electric shielding nature which carried out the laminating of the mesh which becomes the whole surface of a transparent base material from a metal thin film, and fluoroscopy nature To the crevice of the shape of a mesh which is the manufacture approach for mass-producing and was formed in the substrate side thru/or the cylinder side of etching (etching), machining, etc., in order at least by ionizing-radiation hardenability or thermosetting The excessive resin which embedded the resin whose nonelectrolytic plating is possible and was attached after hardening in addition to the crevice like the resin packer who makes scraping and a crevice fill up with resin The crevice side of a substrate side thru/or a cylinder side is made to stick by pressure with the transparent film which is the base material for electromagnetic wave shields whose nonelectrolytic plating is impossible. And the imprint process transferred to this film plane where the resin with which irradiated ionizing radiation, such as light (ultraviolet rays) or an electron ray, or heat was applied, and the crevice was filled up is stiffened, The manufacture approach of the electromagnetic wave shield characterized by forming the mesh which becomes the transparent film plane which has the plating process which performs nonelectrolytic plating to the resin section to which the film plane transferred, and serves as a base material for electromagnetic-shielding plates from a metal thin film.
[Claim 2] The manufacture approach of the electromagnetic wave shield further characterized by performing electrolysis plating to this resin section if needed after nonelectrolytic plating in the plating process of claim 1.
[Claim 3] The manufacture approach of the electromagnetic wave shield characterized by the resin embedded in the crevice of a substrate side thru/or a cylinder side consisting of one sort chosen from acrylic resin, epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts in claim 1 thru/or 2.
[Claim 4] The manufacture approach of the electromagnetic wave shield characterized by distributing and mixing Pd metal in the resin embedded in the crevice of a substrate side thru/or a cylinder side in claim 1 thru/or 3.
[Claim 5] The manufacture approach of an electromagnetic wave shield that the transparent film for electromagnetic wave shields is characterized by being the acrylic, methacrylic one, the polyester, and the film that uses polysulfone as the base which is easy adhesiveness in claim 1 thru/or 4 at the resin with which a mesh-like crevice is filled up.
[Claim 6] The metal thin film layer by which the plater which performs nonelectrolytic plating to the resin section to which the film plane transferred in claim 1 thru/or 5 is set, non-electric-field plating is nickel plating or Cu plating, and plating formation was carried out further is the manufacture approach of the electromagnetic wave shield characterized by consisting of a multilayer configuration more than two-layer.
[Claim 7] The manufacture approach of the electromagnetic wave shield characterized by applying the points to the imprint process and applying adhesives to the transparent film plane for electromagnetic wave shields beforehand in claim 1 thru/or 6.
[Claim 8] The manufacture approach of the electromagnetic wave shield characterized by forming an organic adhesives layer in the substrate side thru/or cylinder side filled up with the resin in which non-electric-field plating is possible in claim 1 thru/or 6.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of an electromagnetic wave shield of having used a metal thin film mesh. Furthermore, it is related with the manufacture approach of the electromagnetic wave shield using the metal thin film mesh for covering in detail the electromagnetic wave generated from electromagnetic wave generation sources, such as the display electron tube.
[0002]
[Description of the Prior Art] It is required that the electron tubes for a display, such as the electronic instrument which generates conventionally the electromagnetic wave which direct people approach and use, for example, a plasma display etc., should stop the strength of electromagnetic wave emission in specification in consideration of the evil by the electromagnetic wave to the body. Furthermore, in the plasma display panel (it is also called Following PDP), since luminescence uses plasma discharge and the unnecessary electromagnetic wave whose frequency band is 30MHz - 130MHz is revealed outside, it is required that an electromagnetic wave should be controlled as much as possible so that evil may not be done to other devices (for example, information processor etc.). It corresponds to these demands, and in order to remove thru/or attenuate the electromagnetic wave which generally flows into the equipment exterior out of the electronic instrument which generates an electromagnetic wave, wrap electromagnetic wave shielding is taken by the suitable conductive member in the periphery sections, such as an electronic instrument which generates an electromagnetic wave. Usually the electromagnetic wave shield which has good fluoroscopy nature by panels for a display, such as a plasma display panel, is formed in the front face of a display.
[0003] An electromagnetic wave shield is comparatively simple for the basic structure itself. To transparent glass and a transparent plastics radical plate surface For example, the thing which carried out thin film formation of the transparent conductive film, such as in JUUMU stannic acid ghost film (ITO film), by vacuum evaporationo, the sputtering method, etc., To transparent glass and a transparent plastics radical plate surface, for example, the thing which stuck suitable metal screens, such as a wire gauze, What prepared the mesh which forms a metal thin film in the whole surface by electroless deposition, vacuum evaporationo, etc., processes this metal thin film into transparent glass and a transparent plastics radical plate surface by the photolithography method etc., and becomes them from a detailed metal thin film is known.
[0004] Since uniform film formation is possible, when the electromagnetic wave shield in which the ITO film was formed on the transparence substrate was excellent in respect of transparency, and the transmission of light became 90% order, and it is generally used for a display etc. all over a substrate, it does not have that it is anxious also about generating of the moire resulting from an electromagnetic wave shield etc. However, in the electromagnetic wave shield in which the ITO film was formed on the transparence substrate, although the ITO film is formed, since vacuum evaporationo, sputtering, and a technique are used, a manufacturing installation is expensive, and since productivity is generally also inferior, while saying that the price of the electromagnetic wave shield as a product itself becomes expensive, there is a title. furthermore, electromagnetic wave emission since single or more figures conductivity is inferior as compared with the electromagnetic wave shield which formed the mesh which consists of a metal thin film in the electromagnetic wave shield in which the ITO film was formed on the transparence substrate -- a ratio -- to a weak object,-like, although it is effective When it uses for a strong object, the electric shielding functioning becomes inadequate, a leakage electromagnetic wave is emitted, and there is satisfying the value of standard or a problem that it may not be able to do. In the

electromagnetic wave shield in which the ITO film was formed on this transparence substrate, although a certain amount of conductivity will improve if thickness of the ITO film is thickened in order to raise conductivity, the problem that transparency falls remarkably in this case occurs. In addition, there is a problem that a manufacture price also becomes more expensive, by making it still thicker.

[0005] Moreover, although it becomes cheap [cost] simply when using the electromagnetic wave shield which stuck the metal screen on transparent glass or a plastics radical plate surface, or when sticking suitable metal screens, such as a wire gauze, on a direct display side, the transmission of the effective metal screen of a mesh (100 - 200 meshes) is 50% or less, and has the serious fault of becoming very dark DISUBUREI.

[0006] Moreover, since appearance processing is carried out by etching processing which used the photolithography method, micro processing is possible, and a high numerical aperture (high permeability) mesh can be created and a mesh is formed with the metal thin film, the thing in which the mesh which becomes transparent glass and a plastics radical plate surface from a metal thin film was formed has the advantage that it is very high and powerful electromagnetic wave emission can be covered, as compared with the ITO film of the above [conductivity] etc. However, **** is unavoidable while saying that the production process is complicated and complicated, the productivity is low and a production cost becomes expensive.

[0007] Thus, there are advantages and disadvantages in each electromagnetic wave shield, respectively, and it is chosen and used according to the application. The electromagnetic wave shield in which the mesh which becomes transparent glass and a plastics radical plate surface from a metal thin film especially was formed is good in respect of electromagnetic wave shielding and light transmission nature, is put on the front face of panels for a display, such as a plasma display panel, in recent years, and has come to be used as an object for electromagnetic wave shielding.

[0008] Here, the electromagnetic wave shield in which the mesh which becomes transparent glass and a plastics radical plate surface from a metal thin film was formed is shown in drawing 4 , and is explained briefly. Drawing 4 (a) is the top view of an electromagnetic wave shield, and a sectional view [in / in drawing 4 (b) / A1-A2 of drawing 4 (a)] and drawing 4 (c) are some enlarged drawings of the mesh section. In addition, the direction of X for clarifying physical relationship and a mesh configuration and the direction of Y are displayed on drawing 4 (a) and drawing 4 (c). It is the electromagnetic wave shield for electromagnetic wave shielding which puts the electromagnetic wave shield shown in drawing 4 on the front face of the display of PDP etc., and is used, it is the thing in which the frame part for touch-down and the mesh section were formed on the whole surface of a transparence substrate, and when the frame part 415 for touch-down is placed and used for the front face of a display, it is formed with the metal thin film same the periphery side of the mesh section 410 as the mesh section so that a scope field may be surrounded. The mesh section 410 consists of two or more Rhine 470 groups and Rhine 450 group which were prepared along Y and the direction of X in parallel mutually at intervals of the predetermined pitch Px and Py, respectively so that the configuration may be expanded to drawing 4 (c) in part and may be shown.

[0009]

[Problem(s) to be Solved by the Invention] For this reason, the approach many electromagnetic wave shields which prepared the mesh which consists of a metal thin film as shown in drawing 4 on the transparence substrate come to be quantitatively called for from the field of that fluoroscopy nature and electromagnetic wave electric shielding nature, and can manufacture a result and this electromagnetic wave shield with sufficient productivity efficiently has come to be searched for. This invention tends to correspond to this, is the manufacture approach of an electromagnetic-shielding plate of having prepared a metal thin film mesh, also in quality, can respond enough, and tends to offer the good manufacture approach of productivity.

[0010]

[Means for Solving the Problem] The manufacture approach of the electromagnetic wave shield of this invention is placed and used for the front face of a display. The electromagnetic wave shield which has the electromagnetic wave electric shielding nature which carried out the laminating of the mesh which becomes the whole surface of a transparent base material from a metal thin film, and fluoroscopy nature To the crevice of the shape of a mesh which is the manufacture approach for mass-producing and was formed in the substrate side thru/or the cylinder side of etching (etching), machining, etc., in order at least by ionizing-radiation hardenability or thermosetting The excessive resin which embedded the resin whose nonelectrolytic plating is possible and was attached after hardening in addition to the crevice like the resin packer who makes scraping

and a crevice fill up with resin The crevice side of a substrate side thru/or a cylinder side is made to stick by pressure with the transparent film which is the base material for electromagnetic wave shields whose nonelectrolytic plating is impossible. And the imprint process transferred to this film plane where the resin with which irradiated ionizing radiation, such as light (ultraviolet rays) or an electron ray, or heat was applied, and the crevice was filled up is stiffened, It has the plating process which performs nonelectrolytic plating to the resin section to which the film plane transferred, and is characterized by forming the mesh which becomes a transparent film plane used as the base material for electromagnetic-shielding plates from a metal thin film. And in the above-mentioned plating process, it is further characterized by performing electrolysis plating to this resin section if needed after nonelectrolytic plating. And in the above, it is characterized by the resin embedded in the crevice of a substrate side thru/or a cylinder side consisting of one sort chosen from acrylic resin, epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts. And in the above, it is characterized by distributing and mixing Pd metal powder and nickel metal powder in the resin embedded in the crevice of a substrate side thru/or a cylinder side again. Moreover, in the above, the transparent film for electromagnetic wave shields is characterized by being the acrylic, methacrylic one, the polyester, and the film that uses polysulfone as the base which is easy adhesiveness at the resin with which a mesh-like crevice is filled up. Moreover, in the above, it is characterized by setting the plater which performs nonelectrolytic plating to the resin section to which the film plane transferred, and the metal thin film layer by which non-electric-field plating is nickel plating or Cu plating, and plating formation was carried out further consisting of a multilayer configuration more than two-layer. Moreover, in the above, it is characterized by applying adhesives to an imprint process in the points and the transparence substrate side beforehand for electromagnetic wave shields. Moreover, in the above, it is characterized by forming an organic adhesives layer in the substrate side thru/or cylinder side filled up with the resin in which non-electric-field plating is possible. In addition, a roll-like (cylindrical) thing is said, and a cylinder forms a crevice in the front face, it embeds resin in a crevice and says what transfers the embedded resin to a transferred object as a roll intaglio thru/or a cylinder intaglio here. in addition, the resin which can perform nonelectrolytic plating with which a crevice is filled up -- here -- a pitch -- Pd, nickel, and PdCl2 etc. -- by [in case the resin or non-electric-field plating in the condition of having made the metal thru/or metallic compounds used as a catalyst containing is performed] -- a pitch -- Pd, nickel, and PdCl2 etc. -- it is resin which changes into the condition of having made the metal thru/or metallic compounds used as a catalyst containing. As resin, acrylic resin, epoxy system resin, polycarbonate resin, The thing which consists of one sort chosen from ABS plastics thru/or two or more sorts, or PVA, By the resin of water permeability, such as casein, a maleic-acid vinyl copolymer, a sulfonated polyester emulsion, polyacrylic acid, butyral, and a water-soluble cellulose The thing which made resin carry out distributed mixing of the curing agent for stiffening resin by ionizing radiation, such as heat or light (ultraviolet rays) thru/or an electron ray, the sensitization agent, etc. is mentioned if needed.

[0011]

[Function] The manufacture approach of the electromagnetic wave shield of this invention is enabling offer of the manufacture approach of an electromagnetic-shielding plate of could respond in respect of quality and having excelled in the field of productivity, by making it such a configuration. The electromagnetic wave shield which has electromagnetic wave shielding [, such as PDP as shown in drawing 4 , / for a display / the good fluoroscopy nature and electromagnetic wave shielding / good] by this shall be offered at an early stage so much. In detail this invention by filling up the crevice of the shape of a mesh formed in the substrate side thru/or the cylinder side with the resin whose nonelectrolytic plating is possible, carrying out semi-hardening and transferring this to hardening thru/or the transparent film which is a base material for the plates for electromagnetic wave electric shielding The plate for electromagnetic wave electric shielding is produced, and since the crevice of the shape of a mesh formed in the substrate side thru/or the cylinder side can be repeated and used, it is advantageous in respect of production, and fit for mass production. Moreover, since a crevice is filled up and hardening thru/or the resin by which semi-hardening was carried out are transferred by this resin on a film through direct thru/or adhesives at a film with transparent easy adhesiveness, the imprint nature is good and the quality of the imprinted resin streak section will become good. Moreover, nonelectrolytic plating is possible for the resin with which a mesh-like crevice is filled up, if nonelectrolytic plating is performed after it transfers resin to a film since the transparent film with which it transfers to this resin is that whose nonelectrolytic plating is impossible, plating is performed only in the resin section of the shape of a mesh to

which the film plane transferred, and it can form a metal thin film. Furthermore, electrolysis plating can also be performed based on the metal section by nonelectrolytic plating if needed. They are specifically ionizing-radiation hardenability or thermosetting in order at least in the crevice of the shape of a mesh formed in the substrate side thru/or the cylinder side of etching (etching), machining, etc. The excessive resin which embedded the resin whose nonelectrolytic plating is possible and was attached after hardening in addition to the crevice like the resin packer who makes scraping and a crevice fill up with resin The crevice side of a substrate side thru/or a cylinder side is made to stick by pressure with the transparent film which is the base material for electromagnetic wave shields whose nonelectrolytic plating is impossible. And the imprint process transferred to this film plane where the resin with which irradiated ionizing radiation, such as light (ultraviolet rays) or an electron ray, or heat was applied, and the crevice was filled up is stiffened, It had the plating process which performs nonelectrolytic plating to the resin section to which the film plane transferred, and this is attained by forming the mesh which becomes a transparent film plane used as the base material for electromagnetic-shielding plates from a metal thin film. And what consists of one sort chosen from acrylic resin, epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts as resin embedded in the crevice of a substrate side thru/or a cylinder side is mentioned as a desirable example. Moreover, nonelectrolytic plating nature is made with a positive thing by distributing Pd metal powder to the resin embedded in the crevice of a substrate side thru/or a cylinder side, and mixing in it. Moreover, it is considering as the good thing of imprint nature by considering as the film which uses as the base the acrylic and methacrylic one which are easy adhesiveness, and polyester at the resin filled up with the transparent film which is a base material for electromagnetic wave shields by the mesh-like crevice. Moreover, imprint nature can be raised applying the points to the imprint process and applying adhesives to the transparent film plane for electromagnetic wave shields beforehand, or by forming an organic adhesives layer on the metal thin film layer by which plating formation was carried out. Moreover, when the metal thin film layer by which plating formation is carried out consists of a multilayer configuration more than two-layer, the degree of freedom in the case of mesh creation and the degree of freedom of selection of mesh quality are made with a big thing.

[0012]

[Embodiment of the Invention] The gestalt of operation of this invention is explained based on drawing. Drawing 1 is the production process flow Fig. having shown one example of the gestalt of implementation of the manufacture approach of the electromagnetic wave shield of this invention, and shows the production process of the electromagnetic wave shield for electromagnetic wave shielding placed and used for the front face of the display of PDP as shown in drawing 4 etc. In addition, S10-S80 show a processing step. first, the good substrate or good cylinder of detachability is prepared (S10), and the intaglio which resembled this by etching (etching) etc. and formed the mesh-like crevice is produced. (S20)

Although the good thing of the resin with which a crevice is filled up behind, and detachability is desirable as a substrate or a cylinder and stainless steel material (SUS304 material, SUS430 material) etc. is mentioned, limitation is not carried out to this. In using copper material, it performs and uses Cr plating for a front face. After production of a crevice pretreats cleaning, pickling, etc. to a processing base material, a photosensitive resist is applied (S21), the applied resist is dried (S22), adhesion exposure is carried out using the predetermined pattern version (S23), and subsequently it performs a development, and forms the resist pattern which has a desired mesh-like pattern on a substrate side. (S24) And a resist is removed, after performing baking processing of a resist (S25) and forming a crevice by etching after this if needed (S26). (S27) As a photosensitive resist, although especially limitation is not carried out, since water-soluble casein, PVA, gelatin, etc. can carry out water development and become cheap also in cost, they are [that etching-proof nature and platemaking nature should just avoid] advantageous.

[0013] Subsequently, the resin whose nonelectrolytic plating is possible is embedded after hardening, the excessive resin attached in addition to the crevice is scratched to a crevice, and resin is filled up into it with ionizing-radiation hardenability or thermosetting only to a crevice. (S30) Subsequently the crevice side of a substrate side thru/or a cylinder side is made to stick by pressure with the transparent film which is the base material for electromagnetic wave shields whose nonelectrolytic plating is impossible, ionizing radiation, such as light (ultraviolet rays) or an electron ray, is irradiated, or heat is applied, and it is made to transfer to this film plane, where the resin with which the crevice was filled up is stiffened. (S40)

[0014] It is what has a having [to ionizing radiation, such as light (ultraviolet rays) thru/or an electron ray,]-as

resin with which crevice is filled up-hardenability thing, or heat rigidity. It is required after hardening for nonelectrolytic plating to be possible. As a pitch Acrylic resin, What consists of one sort chosen from epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts, Or the resin of water permeability, such as PVA, casein, a maleic-acid vinyl copolymer, a sulfonated polyester emulsion, polyacrylic acid, butyral, and a water-soluble cellulose, is used. these resin -- Pd, nickel, and PdCl2 etc. -- non-electric-field plating is behind performed in the condition of having made the metal thru/or metallic compounds used as a catalyst containing. To the pitch which consists of one sort chosen from acrylic resin, epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts, beforehand Pd, nickel and PdCl2 etc. -- the primary method with which make contain the metal thru/or metallic compounds used as a catalyst, and a crevice is made to fill up -- Pd, nickel, and PdCl2 It PVA(s). etc. -- the metal thru/or metallic compounds used as a catalyst is not contained -- [or] Casein, a maleic-acid vinyl copolymer, the sulfonated polyester emulsion, resin after making a crevice fill up with the resin of water permeability, such as polyacrylic acid, butyral, and a water-soluble cellulose, and imprinting this to a substrate -- Pd, nickel, and PdCl2 etc. -- the metal thru/or metallic compounds used as a catalyst is infiltrated, and there is the second method of performing non-electric-field plating. In addition, resin is made to carry out distributed mixing of the curing agent for stiffening resin by ionizing radiation, such as heat or light (ultraviolet rays) thru/or an electron ray, the sensitization agent, etc. in a primary method and the second approach if needed.

[0015] Especially, as a transparent film which is a base material for electromagnetic wave shields, although the film which uses as the base the acrylic and methacrylic one which are easy adhesiveness, and polyester at the resin with which a mesh-like crevice is filled up is desirable, limitation is not carried out to this. As a transparent film, although a triacetyl cellulose film, a diacetyl cellulose film, an acetate-butylate cellulose film, a polyether sulphone film, Pori acrylic resin, a polyurethane system resin film, polyester film, a polycarbonate film, a polysulfone film, a polyether film, a trimethyl pentene film, a polyether ketone film, an acrylonitrile (meta) film, etc. can be used, specifically, it is suitable at the point that biaxial-stretching polyester is excellent in transparency and endurance especially. Although the thickness usually has a 8 micrometers - about 1000 micrometers desirable thing, limitation is not carried out to this. the above -- as light transmittance of a transparent film, although 100% of thing is an ideal, it is desirable to choose the thing of 80% or more of permeability.

[0016] Subsequently, if needed, a film is cut to predetermined die length (S50), nonelectrolytic plating is performed to the resin section to which the film plane transferred, and the mesh which becomes a transparent film plane for electromagnetic-shielding plates from a metal thin film is formed so that it may be easy to carry out plating processing. (S60) the pitch which consists of one sort chosen from acrylic resin, epoxy system resin, polycarbonate resin, and ABS plastics thru/or two or more sorts in the case of a primary method as already stated -- Pd, nickel, and PdCl2 etc. -- the metal thru/or metallic compounds used as a catalyst is made to contain, the hardened resin is etched, and after opening a hole so that plating liquid may permeate, non-electric-field plating is performed. When an epoxy resin and acrylic resin are used as resin by the primary method, etching is performed with the alkali mixed liquor of permanganic acid, and it neutralizes or returns by oxalic acid after etching. When ABS plastics, polycarbonate resin, and acrylic resin are used as resin by the primary method, alkali (Naoh, KOH, etc.) neutralizes using the etching reagent of chromic anhydride + concentrated sulfuric acid (100% of sulfuric acids). As already stated, moreover, in the case of the second approach as the resin with which a crevice is made to fill up -- Pd, nickel, and PdCl2 It PVA(s). etc. -- the metal thru/or metallic compounds used as a catalyst is not contained -- Casein, a maleic-acid vinyl copolymer, the sulfonated polyester emulsion, the inside of resin after imprinting this using the resin of water permeability, such as polyacrylic acid, butyral, a water-soluble cellulose, and ethocell, -- Pd, nickel, PdCl2, and SnCl2 etc. -- the metal thru/or metallic compounds used as a catalyst is infiltrated, and non-electric-field plating is performed.

[0017] Like drawing 3 which forms a crevice and is later mentioned in a cylinder, when transferring resin to a film continuously, a film may not be cut but plating processing may be performed continuously. In this case, the above is further excelled in the field of mass production. In addition, if needed, it continues at nonelectrolytic plating and electrolysis plating is applied. As a metal thin film by the nonelectrolytic plating for forming a mesh, it is cheap, the good thing of processability is a desirable ingredient, and monolayers, such as Cu and nickel, or the thing which made these the multilayer is mentioned as an ingredient used concretely. since the contrast of a surface image will fall further again if metallic luster has an observer side face when it is used

having put the electromagnetic-shielding plate on the front face of a display -- a metal thin film -- melanism -- the melanism which prepares a layer -- processing is performed if needed. For example, when a metal thin film is Cu layer, melanism can be carried out by processing which oxidizes or sulfurates the surface section of exposed Cu layer. In addition, although the thickness of the metal thin film for covering an electromagnetic wave effectively is so good that it is thick in respect of electromagnetic wave electric shielding, from the point of workability, its about 0.2-10 micrometers are desirable.

[0018] In addition, in order to ensure transition of resin, adhesives are applied to the imprint process in the points and the field of a beforehand transparent film if needed. (S80)

Or imprint nature can also be raised by forming the organic adhesives layer in the substrate side thru/or cylinder side filled up with the resin in which non-electric-field plating is possible.

[0019] Subsequently, a film can be cut to predetermined die length and width of face (S70), and the electromagnetic wave shield in which the mesh which becomes a desired transparent film plane for electromagnetic wave shields from a metal thin film was formed can be formed.

[0020]

[Example] Subsequently, an example is given and this invention is explained further.

(Example 1) This example is an example which created the electromagnetic wave shield which imprints resin from the substrate in which the crevice was formed, to the transparent film which is a base material for electromagnetic wave shields, performs non-electrolyzed metal plating to resin, and is shown in drawing 4 . Each processing in an example 1 is what showed the condition of a cross section a part, and drawing 2 is a sectional view in the location corresponding to drawing 4 (b). Hereafter, it explains based on drawing 2 . the inside of drawing 2 , and 110 -- a substrate (SUTENSU substrate) and 115 -- a crevice and 120 -- resin and 125 -- hardening resin and 130 -- ionizing radiation (ultraviolet rays) and 150 -- a metal thin film (Cu) and 155 -- melanism -- as for a layer, a film (base material for electromagnetic wave shields) with transparent 210, and 220, adhesives and 230 are protective layers. The substrate 110 which formed in the whole surface the crevice which consists of stainless steel material was prepared. (Drawing 2 (a)) The stainless plate (SUS304 material) with a thickness of 0.15mm was used as a substrate which forms a mesh-like crevice. The water-soluble casein resist which makes a potassium dichromate an optical sensitization agent is hung on this stainless plate side, a flow-coating cloth is carried out, and it dries. Subsequently Adhesion exposure of the mesh-like mesh pattern (100 meshes, width of face of 28 micrometers) is carried out. After the water of predetermined temperature having performed the development and forming a mesh-like resist pattern on a substrate side, baking processing of this was carried out by 250-degreeC, it etched in the ferric-chloride water solution by having used this resist pattern as the mask for etching, and the crevice was formed in the whole surface of a stainless plate. Heat lye performed removal of a resist, it washed after this, and the substrate 110 shown in drawing 2 (a) was obtained.

[0021] Subsequently, the acrylic resin of the ultraviolet-rays (it is also called UV light) hardenability which carried out distributed mixing of the Pd metal powder into it was embedded in the crevice 115, and the resin attached to parts other than a crevice carried out squeegee removal. (Drawing 2 (b))

[0022] Subsequently, after the crevice 115 side has stuck the substrate 110 by pressure with the transparent film 210 which consists of polyester resin, while irradiating light (ultraviolet rays) from a film 210 side (drawing 2 (c)) and stiffening the resin in a crevice 115, it was made to transfer to a film 210 side through the adhesives 220 formed in the film plane. (Drawing 2 (d)) Thickness of a film was set to 0.1mm. Thereby, the configuration 125 which met the intaglio configuration of a substrate 110, i.e., the mesh-like hardening resin section, was formed on the 210th page of a film. In addition, in advance of the imprint to the film of resin, the adhesives 220 of ultraviolet-rays hardenability were beforehand applied to the thickness of about 30 micrometers at homogeneity on the mesh formation side face of the transparent film 210 of the polyester which is a base material for electromagnetic wave shields. The adhesives of ultraviolet-rays hardenability used the acrylate monomer and the photopolymerization initiator as the principal component, and benzoyl peroxide was used for them as a photopolymerization initiator here, using 2-ethyl KISHIRU acrylate, 1.4-butanediol acrylate, etc. as an ARURI rate monomer.

[0023] Subsequently, the mesh of the metal thin film which performs non-electrolytic copper plating on the following plating conditions, and consists this film of plating was formed. (Drawing 2 (e))

(Plating conditions)

Bath presentation: OPC750M (the Okuno drug industry incorporated company make)

OPC750MA 100 ml/l OPC750MB 100 ml/l OPC750MC 2 - 5 ml/l Solution temperature 50-degreeC Plating rate 0.5micromin Plating thickness 5 micrometers Result line breadth In addition, it point-came up to radio **** plating, and chemical etching of the hardened resin was carried out with the alkali mixed liquor of permanganic acid, and 30 micrometers was changed into the condition (it was made porous) of having opened the hole in the resin section (hardening resin 125). Then, it neutralized in oxalic acid. And after activating after that Pd metal side by which distributed mixing was carried out into resin with the hydrochloric acid, the sulfuric acid, etc., non-electric-field plating was performed. In order to change into the condition (it was made porous) of having opened the hole in the resin section (hardening resin 125) and to perform non-electric-field plating, the plating section (metal thin film 150) of drawing 2 (e), drawing 2 (f), and drawing 2 (g) has arrived at even the interior of the resin section (hardening resin 125). Moreover, if the ingredients (an amine, silicone, etc.) of plating inhibition are paid to the adhesives layer at the time of imprinting, plating adhesion in the adhesives layer surface section with unnecessary adhesion of plating can be prevented.

[0024] subsequently, the part which plating copper 150 exposed -- oxidizing -- melanism -- the layer 155 was formed.

(Drawing 2 (f)) It formed in the imprint side of the transparent film 210 of the polyester which the metal thin film mesh which consists of plating copper 150 subsequently transferred all over the predetermined field containing the mesh section excluding the lead-wire cash-drawer section from a surrounding frame type copper section in the protective layer 230 of a transparent acrylic, and considered as the electromagnetic wave shield. (Drawing 2 (g))

Thus, although the electromagnetic wave shield was formed, it set in the front face of a plasma display (PDP) and the electromagnetic wave electric shielding nature was checked, the effectiveness as a request was acquired. In addition, the stainless steel substrate 110 with which the crevice 115 was formed above was able to be used semipermanently again repeatedly.

[0025] (Example 2) An example 2 transfers the resin filled up with the example 1 into the crevice to the transparent film which consists of polyester of 0.1mm thickness which is a base material for electromagnetic wave shields with the equipment shown in drawing 3 . Others were performed like the example 1.

[0026] Actuation of the equipment shown in drawing 3 is explained briefly. First, on both sides of the film 320 which prepared the adhesives layer in the side to which resin is transferred like an example 1, it supplies between two support rolls 380. Subsequently, after turning an adhesives layer side to the roll intaglio 310 side and being inserted between the roll intaglio 310 and the press roll 370, it is inserted into the press roll 375 and the roll intaglio (it is also called a cylinder intaglio) 310, and is pulled out, but the pressure welding of the film 320 is carried out so that it may meet to the field of the roll intaglio 310 by both rolls between the press roll 370 and the press roll 375. On the other hand, it is applied to the crevice 315 of the roll intaglio 310 so that resin 330 may fill a crevice 315 from nozzle coating equipment 350, and the resin 330 attached by the doctor 390 in addition to crevice 315 is removed, and the crevice 315 of the roll intaglio 310 progresses to the press roll 370 side. That is, where only a crevice 315 is filled up with resin, the roll intaglio 310 rotates to the direction of the arrow head of drawing. Although it is in the condition that the film 320 was inserted and stuck between the press roll 370 and the roll intaglio 310 and progresses to the press roll 375 side further with rotation of the roll intaglio 310, ultraviolet rays are irradiated from a film side between the press roll 370 and the press roll 375, and resin is stiffened. By hardening of resin, the hardened resin 335 is transferred to a film 320 side through adhesives. Then, it passes along the press roll 375 and a film 320 will be in the condition of having separated with the roll intaglio 310 and having transferred the hardened resin 335 to the film 320.

[0027] Thus, after performing nonelectrolytic plating like an example 1 using the obtained film 320 to which the hardened resin 335 was transferred from the roll intaglio 310 in the band-like state, it cut to predetermined die length and width of face, and the desired electromagnetic wave shield was obtained. The electromagnetic wave shield of the same quality as an example 1 was able to be obtained.

[0028] (Example 3) as the resin which fills up a crevice with an example 3 in an example 1 -- Pd, nickel, and PdCl2 etc. -- after imprinting this using PVA with the water permeability which does not contain the metal thru/or metallic compounds used as a catalyst, into a pitch, Pd used as a catalyst is made to contain and non-electric-field plating is performed. Others were able to be performed like the example 1 and were able to obtain the electromagnetic wave shield of the same quality as an example 1. The processing which was made to contain Pd used as a catalyst and performed non-electric-field plating into the pitch after the imprint hereafter is

explained briefly. First, after the imprint, dipping of the resin section (hardening resin 125) was carried out to the stannous chloride solution, and stannous chloride was infiltrated into the resin section. Subsequently, after rinsing, the resin section (hardening resin 125) was put into the palladium-chloride solution, and Pd (palladium) was deposited in the resin section. It means that a result and Pd deposited in the resin section by this. Then, non-electric-field plating was performed by making Pd in the resin section into a catalyst.

[0029]

[Effect of the Invention] This invention is the manufacture approach of an electromagnetic wave shield of having the electromagnetic wave electric shielding nature which is placed and used for the front face of the display of PDP etc. and which carried out the laminating of the mesh which becomes the whole surface of a transparent film from a metal thin film, and fluoroscopy nature as mentioned above, and also in quality, it can respond enough and it is enabling offer of the good manufacture approach of productivity.

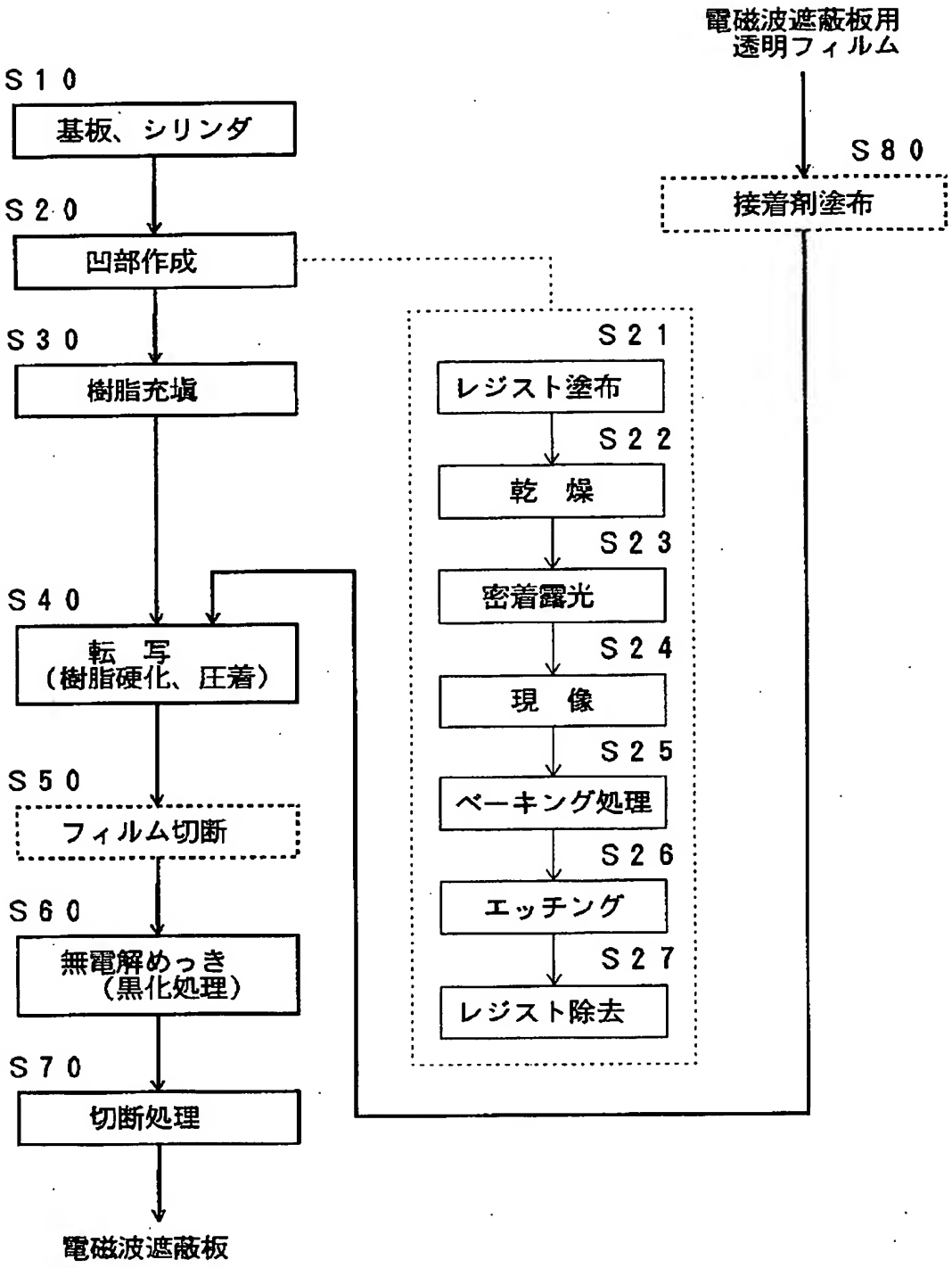
[Translation done.]

* NOTICES *

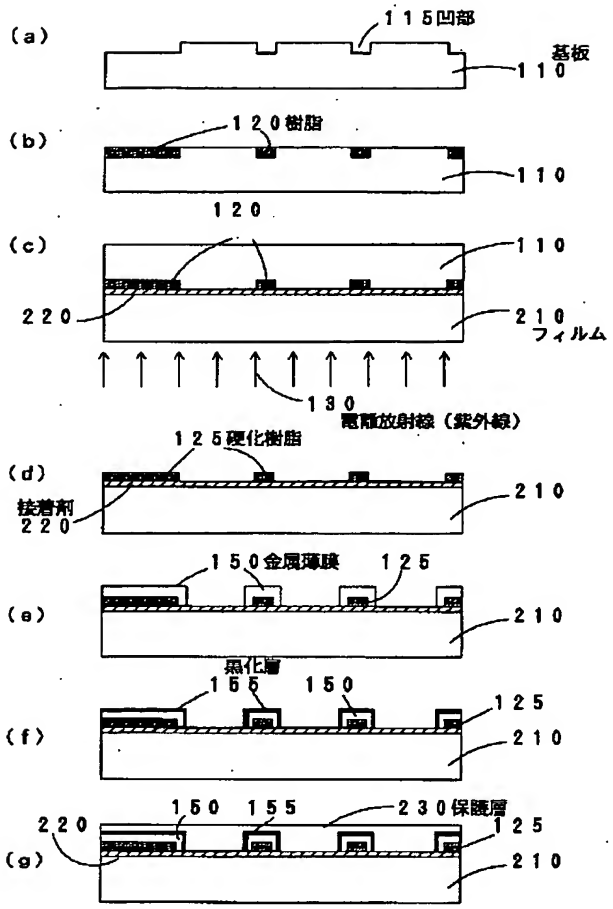
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

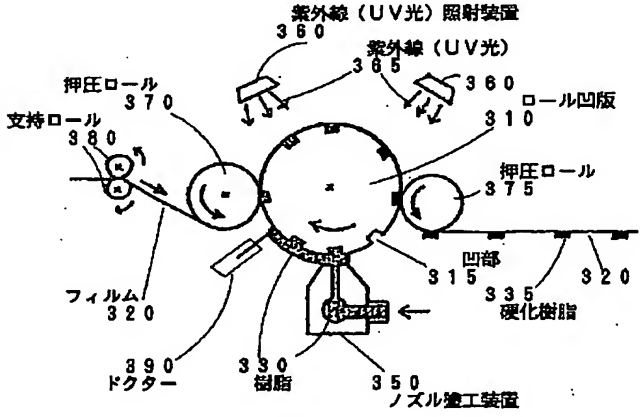
[Drawing 1]


電磁波遮蔽板用
透明フィルム
S10
基板、シリンダ
S80
接着剤塗布
S20
凹部作成
S30
樹脂充填
S21
レジスト塗布
S22
乾　燥
S23
密着露光
S24
現　像
S25
ベーキング処理
S26
エッチング
S27
レジスト除去
S40
転　写
（樹脂硬化、圧着）
S50
フィルム切断
S60
無電解めっき
（黒化処理）
S70
切断処理
電磁波遮蔽板

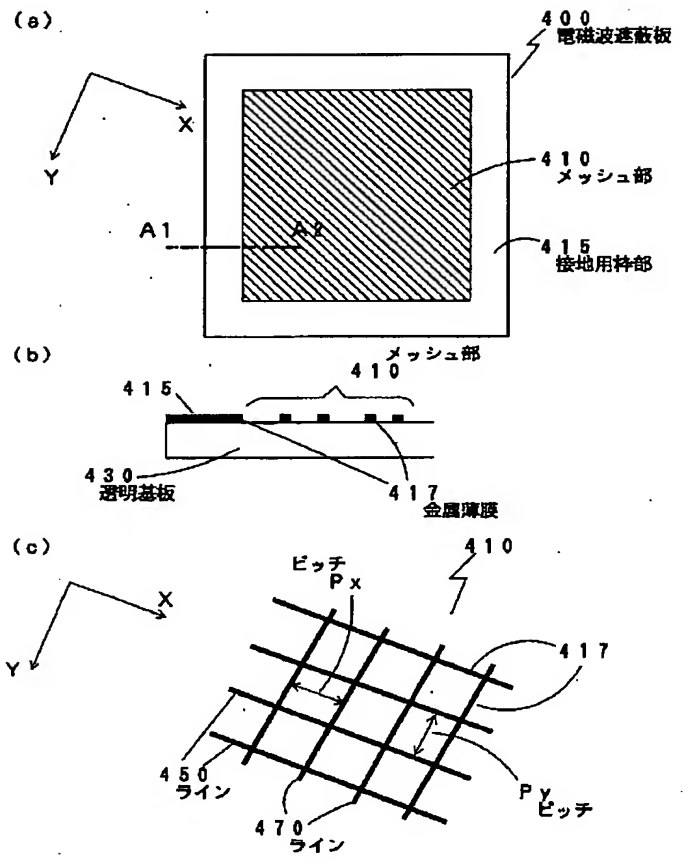
[Drawing 2]



[Drawing 3]



[Drawing 4]



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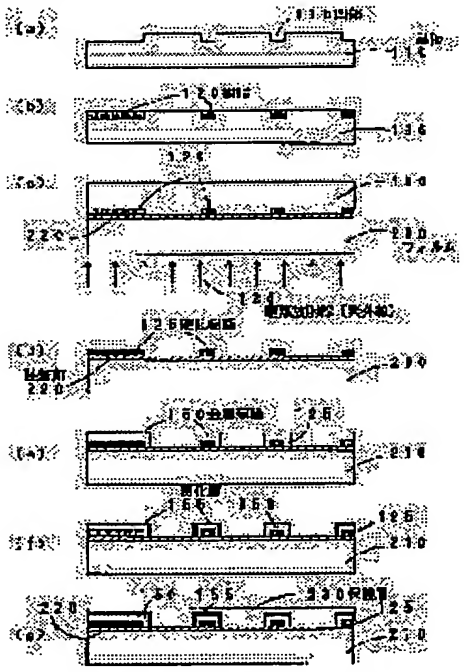
(72)Inventor : NAGASAKI OSAMU

(54) PRODUCTION METHOD FOR ELECTROMAGNETIC WAVE SHIELDING PLATE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a production method for electromagnetic wave shielding plate which is responsive to quality, proper for mass production, and having mesh of metal thin film.
SOLUTION: In a mesh shape recess 115 formed by etching and the like on a substrate surface or a cylinder surface, a resin 120 hardened by ionization radiation or by heat and capable of electroless plating after hardening is embedded. Remaining resin adhered beside the recess is scratched off and the resin is filled in resin filling process. The recess side of the substrate surface of the cylinder surface is pressed to the base material of electromagnetic wave shield plate transparent film 210 in capable of electrolyess plating, ionization radiation 130 is irradiated and resin filling the recess is transferred on the film surface after hardening in transferring process. Electroless plating is applied on the resin part of the transferred film surface in plating process. Thus, on the transparent film surface to be the base material of electromagnetic shield plate, mesh made of metal thin film is formed.



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	３１８		３１８Ｚ
Ｈ０１Ｊ　17/49		Ｈ０１Ｊ　17/49	Ｚ
Ｈ０５Ｋ　9/00		Ｈ０５Ｋ　9/00	Ｖ

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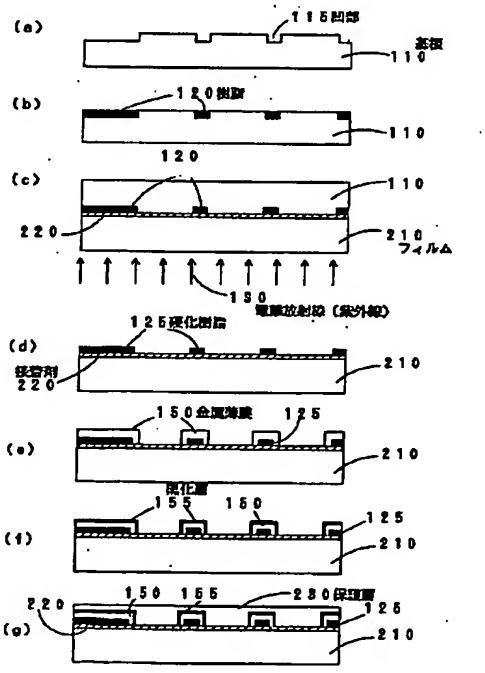
(54)【発明の名称】　電磁波遮蔽板の製造方法

(57)【要約】　（修正有）

【課題】　品質的にも対応でき、量産性に適する、金属薄膜からなるメッシュを設けた電磁波遮蔽板の製造方法を提供する。

【解決手段】　基板面ないしシリンダ面にエッチング等により形成したメッシュ状の凹部１１５に、電離放射線硬化性又は熱硬化性で、硬化後に無電解めっきができる樹脂１２０を埋め込み、凹部以外に付いた余分の樹脂を掻き取り、凹部に樹脂を充填させる樹脂充填工程と、基板面ないしシリンダ面の凹部側を、無電解めっきができない電磁波遮蔽板用の基材である透明なフィルム２１０と圧着させ、電離放射線１３０を照射し、凹部に充填した樹脂を硬化させた状態でフィルム面に転移させる転写工程と、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程とを有し、電磁遮蔽板用の基材となる透明なフィルム面に金属薄膜からなるメッシュを形成する。



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【特許請求の範囲】

【請求項１】　ディスプレイの前面に置いて用いられる、透明な基材の一面に金属薄膜からなるメッシュを積層した電磁波遮蔽性と透視性を有する電磁波遮蔽板を、量産するための製造方法であって、少なくとも順に、基板面ないしシリンダ面にエッチング（食刻）、機械加工等により形成されたメッシュ状の凹部に、電離放射線硬化性あるいは熱硬化性で、硬化後に無電解めっきができる樹脂を埋め込み、凹部以外に付いた余分の樹脂を掻き取り、凹部に樹脂を充填させる樹脂充填工程と、基板面ないしシリンダ面の凹部側を、無電解めっきができない電磁波遮蔽板用の基材である透明なフィルムと圧着させ、且つ光（紫外線）あるいは電子線等の電離放射線を照射し、あるいは熱をかけ、凹部に充填された樹脂を硬化させた状態で該フィルム面に転移させる転写工程と、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程とを有し、電磁遮蔽板用の基材となる透明なフィルム面に金属薄膜からなるメッシュを形成することを特徴とする電磁波遮蔽板の製造方法。

【請求項２】　請求項１のめっき工程において、無電解めっき後に、更に、必要に応じ、該樹脂部に電解めっきを施すことを特徴とする電磁波遮蔽板の製造方法。

【請求項３】　請求項１ないし２において、基板面ないしシリンダ面の凹部に埋め込む樹脂が、アクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなることを特徴とする電磁波遮蔽板の製造方法。

【請求項４】　請求項１ないし３において、基板面ないしシリンダ面の凹部に埋め込む樹脂には、Ｐｄ金属が分散、混入されていることを特徴とする電磁波遮蔽板の製造方法。

【請求項５】　請求項１ないし４において、電磁波遮蔽板用の透明なフィルムが、メッシュ状の凹部に充填される樹脂に易接着性である、アクリル、メタクリル、ポリエステル、ポリスルフォンをベースとするフィルムであることを特徴とする電磁波遮蔽板の製造方法。

【請求項６】　請求項１ないし５において、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程おいて、無電界めっきはＮｉめっきまたはＣｕめっきであり、さらにめっき形成された金属薄膜層は２層以上の多層構成からなることを特徴とする電磁波遮蔽板の製造方法。

【請求項７】　請求項１ないし６において、転写工程に先たち、予め、電磁波遮蔽板用の透明なフィルム面に接着剤を塗布しておくことを特徴とする電磁波遮蔽板の製造方法。

【請求項８】　請求項１ないし６において、無電界めっきが可能な樹脂を充填した基板面ないしシリンダー面に有機接着剤層を形成することを特徴とする電磁波遮蔽板の製造方法。

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【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、金属薄膜メッシュを用いた電磁波遮蔽板の製造方法に関する。更に詳しくは、ディスプレイ電子管等の電磁波発生源から発生する電磁波を遮蔽するための金属薄膜メッシュを用いた電磁波遮蔽板の製造方法に関する。

【０００２】

【従来の技術】従来より、直接人が接近して利用する電磁波を発生する電子装置、例えばプラズマディスプレイ等のディスプレイ用電子管は、人体への電磁波による弊害を考慮して電磁波放出の強さを規格内に抑えることが要求されている。更に、プラズマディスプレイパネル（以下ＰＤＰとも言う）においては、発光はプラズマ放電を利用しているので、周波数帯域が３０ＭＨｚ～１３０ＭＨｚの不要な電磁波を外部に漏洩するため、他の機器（例えば情報処理装置等）へ弊害を与えないよう電磁波を極力抑制することが要求されている。これら要求に対応し、一般には、電磁波を発生する電子装置から装置外部へ流出する電磁波を除去ないし減衰させるために、電磁波を発生する電子装置などの外周部を適当な導電性部材で覆う電磁波シールドが採られる。プラズマディスプレイパネル等のディスプレイ用パネルでは、良好な透視性のある電磁波遮蔽板をディスプレイ前面に設けるのが普通である。

【０００３】電磁波遮蔽板は、基本構造自体は比較的簡単なものであり、透明なガラスやプラスチック基板面に、例えばインジュウムー錫酸化物膜（ＩＴＯ膜）等の透明導電性膜を蒸着やスパッタリング法などで薄膜形成したもの、透明なガラスやプラスチック基板面に、例えば金網等の適当な金属スクリーンを貼着したもの、透明なガラスやプラスチック基板面に、無電解メッキや蒸着などにより全面に金属薄膜を形成し、該金属薄膜をフォトリソグラフィー法等により加工して微細な金属薄膜からなるメッシュを設けたもの等が知られている。

【０００４】透明基板上にＩＴＯ膜を形成した電磁波遮蔽板は、透明性の点で優れており、一般的に、光の透過率が９０％前後となり、且つ基板全面に均一な膜形成が可能なため、ディスプレイ等に用いられた場合には、電磁波遮蔽板に起因するモアレ等の発生も懸念することない。しかし、透明基板上にＩＴＯ膜を形成した電磁波遮蔽板においては、ＩＴＯ膜を形成するのに、蒸着やスパッタリング、技術を用いるので、製造装置が高価であり、また、生産性も一般的に劣ることから、製品としての電磁波遮蔽板自体の価格が高価になるという問題がある。更に、透明基板上にＩＴＯ膜を形成した電磁波遮蔽板においては、金属薄膜からなるメッシュを形成した電磁波遮蔽板と比較して、導電性が１桁以上劣ることから、電磁波放出が比的に弱い対象物に対して有効であるが、強い対象物に用いた場合には、その遮蔽機能が不十

分となり、漏洩電磁波が放出されて、その規格値を満足させることかできない場合があるという問題がある。この透明基板上にＩＴＯ膜を形成した電磁波遮蔽板においては、導電性を高めるために、ＩＴＯ膜の膜厚を厚くすればある程度の導電性は向上するが、この場合、透明性が著しく低下するという問題が発生する。加えて、更に厚くすることにより、製造価格もより高価になるという問題がある。

【０００５】また、透明なガラスやプラスチック基板面に金属スクリーンを貼った電磁波遮蔽板を用いる場合、あるいは、金網等の適当な金属スクリーンを直接ディスプレイ面に貼着する場合、簡単であり、かつ、コストも安価となるが、有効なメッシュ（１００－２００メッシュ）の金属スクリーンの透過率が、５０％以下であり、極めて暗いディスプレイとなってしまうという重大な欠点を持っている。

【０００６】また、透明なガラスやプラスチック基板面に金属薄膜からなるメッシュを形成したものは、フオトリソグラフィー法を用いたエッチング加工により外形加工されるため、微細加工が可能で高開口率（高透過率）メッシュを作成することができ、且つ金属薄膜にてメッシュを形成しているので、導電性が上記のＩＴＯ膜等と比して非常に高く、強力な電磁波放出を遮蔽することができるという利点を有する。しかし、その製造工程は煩雑かつ複雑で、その生産性は低く、生産コストが高価になるという問題点を避けることができない。

【０００７】このように、各電磁波遮蔽板にはそれぞれ得失があり、用途に応じて選択して用いられている。中でも、透明なガラスやプラスチック基板面に金属薄膜からなるメッシュを形成した電磁波遮蔽板は、電磁波シールド性、光透過性の面では良好で、近年プラズマディスプレイパネル等のディスプレイ用パネルの前面に置いて、電磁波シールド用として用いられるようになってきた。

【０００８】ここで、透明なガラスやプラスチック基板面に金属薄膜からなるメッシュを形成した電磁波遮蔽板を、図４に示し、簡単に説明しておく。図４（ａ）は電磁波遮蔽板の平面図で、図４（ｂ）は図４（ａ）のＡ１－Ａ２における断面図、図４（ｃ）はメッシュ部の一部の拡大図である。尚、図４（ａ）と図４（ｃ）には、位置関係、メッシュ形状を明確にするための、Ｘ方向、Ｙ方向を表示してある。図４に示す電磁波遮蔽板は、ＰＤＰ等のディスプレイの前面に置き用いられる電磁波シールド用電磁波遮蔽板で、透明基板の一面上に接地用枠部とメッシュ部とを形成したもので、接地用枠部４１５は、ディスプレイの前面に置いて用いられた際にディスプレイの画面領域を囲むように、メッシュ部４１０の外周辺にメッシュ部と同じ金属薄膜で形成されている。メッシュ部４１０は、その形状を図４（ｃ）に一部拡大して示すように、それぞれ所定のピッチＰｘ、Ｐｙ間隔で互いに平行に、Ｙ、Ｘ方向に沿い設けられた複数のライン４７０群とライン４５０群とからなる。

【０００９】

【発明が解決しようとする課題】この為、図４に示すような金属薄膜からなるメッシュを透明基板上に設けた電磁波遮蔽板が、その透視性と電磁波遮蔽性の面から、量的に多く求められるようになり、結果、該電磁波遮蔽板を生産性良く効率的に製造できる方法が求められるようになってきた。本発明はこれに対応するもので、金属薄膜メッシュを設けた電磁遮蔽板の製造方法であって、品質的にも十分対応でき、生産性の良い製造方法を提供しようとするものである。

【００１０】

【課題を解決するための手段】本発明の電磁波遮蔽板の製造方法は、ディスプレイの前面に置いて用いられる、透明な基材の一面に金属薄膜からなるメッシュを積層した電磁波遮蔽性と透視性を有する電磁波遮蔽板を、量産するための製造方法であって、少なくとも順に、基板面ないしシリンダ面にエッチング（食刻）、機械加工等により形成された、メッシュ状の凹部に、電離放射線硬化性、あるいは熱硬化性で、硬化後に無電解めっきができる樹脂を埋め込み、凹部以外に付いた余分の樹脂を掻き取り、凹部に樹脂を充填させる樹脂充填工程と、基板面ないしシリンダ面の凹部側を、無電解めっきができない電磁波遮蔽板用の基材である透明なフィルムと圧着させ、且つ光（紫外線）あるいは電子線等の電離放射線を照射し、あるいは熱をかけ、凹部に充填された樹脂を硬化させた状態で該フィルム面に転移させる転写工程と、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程とを有し、電磁遮蔽板用の基材となる透明なフィルム面に金属薄膜からなるメッシュを形成することを特徴とするものである。そして、上記のめっき工程において、無電解めっき後に、更に、必要に応じ、該樹脂部に電解めっきを施すことを特徴とするものである。そして、上記において、基板面ないしシリンダ面の凹部に埋め込む樹脂が、アクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなることを特徴とするものである。そしてまた、上記において、基板面ないしシリンダ面の凹部に埋め込む樹脂には、Ｐｄ金属粉末、Ｎｉ金属粉末が分散、混入されていることを特徴とするものである。また、上記において、電磁波遮蔽板用の透明なフィルムが、メッシュ状の凹部に充填される樹脂に易接着性である、アクリル、メタクリル、ポリエステル、ポリスルフォンをベースとするフィルムであることを特徴とするものである。また、上記において、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程おいて、無電界めっきはＮｉめっきまたはＣｕめっきであり、さらにめっき形成された金属薄膜層は２層以上の多層構成からなることを特徴とするものである。また、上記において、転写

工程に先たち、予め、電磁波遮蔽板用の透明基板面に接着剤を塗布しておくことを特徴とするものである。また、上記において、無電界めっきが可能な樹脂を充填した基板面ないしシリンダー面に有機接着剤層を形成することを特徴とするものである。尚、ここで、シリンダとはロール状（円筒状）のものを言い、その表面に凹部を形成し、凹部に樹脂を埋め込み、埋め込まれた樹脂を被転写物に転移させるものをロール凹版ないしシリンダ凹版と言う。尚、凹部に充填する無電解めっきができる樹脂とは、ここでは、樹脂分にＰｄ、Ｎｉ、ＰｄＣｌ$_2$等、触媒となる金属ないし金属化合物を含有させた状態の樹脂、あるいは無電界めっきを行う際までに、樹脂分にＰｄ、Ｎｉ、ＰｄＣｌ$_2$等、触媒となる金属ないし金属化合物を含有させた状態にできる樹脂である。樹脂としてアクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなるもの、あるいはＰＶＡ、カゼイン、マレイン酸ビニル共重合体、スルフォン化したポリエステルエマルジョン、ポリアクリル酸、プチラール、水溶性セルロース等の水浸透性の樹脂で、必要に応じ、熱、または光（紫外線）ないし電子線等の電離放射線により樹脂を硬化させるための、硬化剤、感光剤等を樹脂に分散混入させたものが挙げられる。

【００１１】

【作用】本発明の電磁波遮蔽板の製造方法は、このような構成にすることにより、品質面で対応でき、且つ、生産性の面で優れた電磁遮蔽板の製造方法の提供を可能としている。これにより、図４に示すようなＰＤＰ等ディスプレイ用の良好な透視性と電磁波シールド性を兼ね備えた電磁波遮蔽板を多量に早期に提供できるものとしている。詳しくは、本発明は、無電解めっきができる樹脂を、基板面ないしシリンダ面に形成されたメッシュ状の凹部に充填し、硬化ないし半硬化させ、これを電磁波遮蔽用板用の基材である透明なフィルムに転移させることにより、電磁波遮蔽用板を作製するもので、基板面ないしシリンダ面に形成されたメッシュ状の凹部を繰り返して使用することができる為、生産面で有利で量産に向いている。また、凹部に充填され、硬化ないし半硬化された樹脂は、該樹脂に易接着性の透明なフィルムに直接、ないし接着剤を介してフィルムに転移されるため、その転写性は良く、転写された樹脂画線部の品質は良いものとなる。また、メッシュ状の凹部に充填される樹脂は無電解めっきが可能なもので、該樹脂が転移される透明なフィルムは無電解めっきができないものである為、樹脂をフィルムに転移した後に、無電解めっきを行うと、フィルム面に転移されたメッシュ状の樹脂部のみにめっきが行われ、金属薄膜を形成することができる。更に、必要に応じ、無電解めっきによる金属部をもとに電解めっきを行うこともできる。具体的には、少なくとも順に、基板面ないしシリンダ面にエッチング（食刻）、機械加

工等により形成された、メッシュ状の凹部に、電離放射線硬化性、あるいは熱硬化性で、硬化後に無電解めっきができる樹脂を埋め込み、凹部以外に付いた余分の樹脂を掻き取り、凹部に樹脂を充填させる樹脂充填工程と、基板面ないしシリンダ面の凹部側を、無電解めっきができない電磁波遮蔽板用の基材である透明なフィルムと圧着させ、且つ光（紫外線）あるいは電子線等の電離放射線を照射し、あるいは熱をかけ、凹部に充填された樹脂を硬化させた状態で該フィルム面に転移させる転写工程と、フィルム面に転移された樹脂部に無電解めっきを施すめっき工程とを有し、電磁遮蔽板用の基材となる透明なフィルム面に金属薄膜からなるメッシュを形成することにより、これを達成している。そして、基板面ないしシリンダ面の凹部に埋め込む樹脂としては、アクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなるものが好ましい例として挙げられる。また、基板面ないしシリンダ面の凹部に埋め込む樹脂に、Ｐｄ金属粉末を分散、混入することにより、無電解めっき性を確実なものとできる。また、電磁波遮蔽板用の基材である透明なフィルムを、メッシュ状の凹部に充填される樹脂に易接着性である、アクリル、メタクリル、ポリエステルをベースとするフィルムとすることにより、転写性の良いものとしている。また、転写工程に先たち、予め、電磁波遮蔽板用の透明なフィルム面に接着剤を塗布しておくことにより、あるいは、めっき形成された金属薄膜層の上に有機接着剤層を形成することにより、転写性を上げることができる。また、めっき形成される金属薄膜層が２層以上の多層構成からなることにより、メッシュ作成の際の自由度、メッシュ品質の選択の自由度を大きなものとできる。

【００１２】

【実施の形態】本発明の実施の形態を図に基づいて説明する。図１は、本発明の電磁波遮蔽板の製造方法の実施の形態の１例を示した製造工程フロー図であり、図４に示すような、ＰＤＰ等のディスプレイの前面に置き用いられる電磁波シールド用電磁波遮蔽板の製造工程を示したものである。尚、Ｓ１０～Ｓ８０は、処理ステップを示すものである。先ず、剥離性の良い基板あるいはシリンダを準備し（Ｓ１０）、これにエッチング（食刻）等によりにメッシュ状の凹部を形成した凹版を作製する。（Ｓ２０）

基板あるいはシリンダとしては、後に凹部に充填する樹脂と剥離性の良いものが好ましく、ステンレス材（ＳＵＳ３０４材、ＳＵＳ４３０材）等が挙げられるがこれに限定はされない。銅材を使用する場合には表面にＣｒめっきを施して用いる。凹部の作製は、処理基材に対し、脱脂、酸洗い等の前処理を行った後、感光性のレジストを塗布し（Ｓ２１）、塗布されたレジストを乾燥し（Ｓ２２）、所定のパターン版を用いて密着露光し（Ｓ２

３）、次いで現像処理を行い、所望のメッシュ状パターンを有するレジストパターンを基板面上に形成する。（Ｓ２４）そして、この後、必要に応じ、レジストのベーキング処理を行い（Ｓ２５）、エッチングにて凹部を形成した（Ｓ２６）後、レジストを除去する。（Ｓ２７）感光性のレジストとしては、耐エッチング性、製版性がよければ良く、特に限定はされないが、水溶性のカゼイン、ＰＶＡ、ゼラチン等は水現像でき、コスト的にも安価となるので有利である。

【００１３】次いで、凹部に、電離放射線硬化性、あるいは熱硬化性で、硬化後に無電解めっきができる樹脂を埋め込み、凹部以外に付いた余分の樹脂を掻き取って、凹部のみへ樹脂の充填を行う。（Ｓ３０）次いで、基板面ないしシリンダ面の凹部側を、無電解めっきができない電磁波遮蔽板用の基材である透明なフィルムと圧着させ、且つ光（紫外線）あるいは電子線等の電離放射線を照射し、あるいは熱をかけ、凹部に充填された樹脂を硬化させた状態で該フィルム面に転移させる。（Ｓ４０）

【００１４】凹部に充填する樹脂としては、光（紫外線）ないし電子線等の電離放射線に対し硬化性を有するのものあるいは熱硬性を有するもので、硬化後に無電解めっきができることが必要で、樹脂分としてアクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなるもの、あるいは、ＰＶＡ、カゼイン、マレイン酸ビニル共重合体、スルフォン化したポリエステルエマルジョン、ポリアクリル酸、ブチラール、水溶性セルロース等の水浸透性の樹脂が用いられる。これらの樹脂にＰｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含有させた状態で、後に無電界めっきを施す。アクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなる樹脂分にあらかじめＰｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含有させて凹部に充填させる第一の方法、あるいは、Ｐｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含有しないＰＶＡ、カゼイン、マレイン酸ビニル共重合体、スルフォン化したポリエステルエマルジョン、ポリアクリル酸、ブチラール、水溶性セルロース等の水浸透性の樹脂を凹部に充填させ、これを基板に転写した後、樹脂に、Ｐｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含浸させて、無電界めっきを施す第二の方法がある。尚、第一の方法、第二の方法においては、必要に応じ、熱、または光（紫外線）ないし電子線等の電離放射線により樹脂を硬化させるための、硬化剤、感光剤等を樹脂に分散混入させておく。

【００１５】特に、電磁波遮蔽板用の基材である透明なフィルムとしては、メッシュ状の凹部に充填される樹脂に易接着性である、アクリル、メタクリル、ポリエステルをベースとするフィルムが好ましいが、これに限定はされない。透明なフィルムとしては、具体的には、トリアセチルセルロースフィルム、ジアセチルセルロースフィルム、アセテートブチレートセルロースフィルム、ポリエーテルサルホンフィルム、ポリアクリル系樹脂、ポリウレタン系樹脂フィルム、ポリエステルフィルム、ポリカーボネートフィルム、、ポリスルホンフィルム、ポリエーテルフィルム、トリメチルペンテンフィルム、ポリエーテルケトンフィルム、（メタ）アクリロニトリルフィルム等が使用できるが、特に、二軸延伸ポリエステルが透明性、耐久性に優れている点で好適である。その厚みは、通常は８μｍ～１０００μｍ程度のものが好ましいが、これに限定はされない。上記透明なフィルムの光透過率としては、１００％のものが理想であるが、透過率８０％以上のものを選択することが好ましい。

【００１６】次いで、必要に応じ、めっき処理がし易いように、所定の長さにフィルムを切断し（Ｓ５０）、フィルム面に転移された樹脂部に無電解めっきを施し、電磁遮蔽板用の透明なフィルム面に金属薄膜からなるメッシュを形成する。（Ｓ６０）既にのべたように、第一の方法の場合には、アクリル系樹脂、エポキシ系樹脂、ポリカーボネート樹脂、ＡＢＳ樹脂から選ばれた１種ないし複数種からなる樹脂分にＰｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含有させ、硬化した樹脂をエッチングして、めっき液が浸透するように孔を開けた後に、無電界めっきを施す。第一の方法で、樹脂としてエポキシ樹脂、アクリル樹脂を用いた場合には、エッチングは過マンガン酸のアルカリ混合液にて行い、エッチング後、シュウ酸で中和、あるいは還元しておく。第一の方法で、樹脂としてＡＢＳ樹脂、ポリカーボネート樹脂、アクリル樹脂を用いた場合には、無水クロム酸＋濃硫酸（硫酸１００％）のエッチング液を用い、アルカリ（Ｎａｏｈ、ＫＯＨ等）で中和しておく。また、既に述べたように、第二の方法の場合には、凹部に充填させる樹脂としては、Ｐｄ、Ｎｉ、ＰｄＣｌ₂等、触媒となる金属ないし金属化合物を含有しないＰＶＡ、カゼイン、マレイン酸ビニル共重合体、スルフォン化したポリエステルエマルジョン、ポリアクリル酸、ブチラール、水溶性セルロース、エトセル等の水浸透性の樹脂を用い、これを転写した後、樹脂中に、Ｐｄ、Ｎｉ、ＰｄＣｌ₂、、ＳｎＣｌ₂等、触媒となる金属ないし金属化合物を含浸させて無電界めっきを施す。

【００１７】シリンダに凹部を形成して、後述する図３のように、連続してフィルムに樹脂を転移する場合には、フィルムを切断せず連続してめっき処理を行っても良い。この場合、量産の面では上記より更に優れる。尚、必要に応じ、無電解めっきに引続き電解めっきをかける。メッシュを形成するための無電解めっきによる金属薄膜としては、安価で、処理性の良いものが好ましい材料であり、具体的に使用される材料としては、Ｃｕ、Ｎｉ等の単層、あるいはこれらを多層にしたものが挙げられる。さらにまた、電磁遮蔽板をディスプレイの前面

に置いて使用したとき、観察者側面が金属光沢があると表面画像のコントラストが低下するため、金属薄膜に黒化層を設ける黒化処理を、必要に応じて行う。例えば、金属薄膜がＣｕ層である場合には、露出したＣｕ層の表面部を酸化または硫化する処理により黒化することができる。尚、電磁波を効果的に遮蔽するための金属薄膜の厚さは、電磁波遮蔽の点では厚い程良いが加工性の点からは０．２～１０μｍ程度が好ましい。

【００１８】尚、樹脂の転移を確実とするために、必要に応じ、転写工程に先たち、予め、透明なフィルムの面に接着剤を塗布しておく。（Ｓ８０）

または、無電界めっきが可能な樹脂を充填した基板面ないしシリンダー面に有機接着剤層を形成しておくことにより、転写性を上げることもできる。

【００１９】次いで、フィルムを所定の長さ、幅に切断して（Ｓ７０）、所望の、電磁波遮蔽板用の透明なフィルム面に金属薄膜からなるメッシュを形成した電磁波遮蔽板を形成することができる。

【００２０】

【実施例】次いで実施例を挙げ、本発明を更に説明する。

（実施例１）本実施例は、凹部を形成した基板から電磁波遮蔽板用の基材である透明なフィルムへ樹脂を転写し、樹脂に無電解金属めっきを施して、図４に示す電磁波遮蔽板を作成した例である。図２は実施例１における各処理の一部断面の状態を示したもので、図４（ｂ）に対応する位置における断面図である。以下、図２に基づいて説明する。図２中、１１０は基板（ステンス基板）、１１５は凹部、１２０は樹脂、１２５は硬化樹脂、１３０は電離放射線（紫外線）、１５０は金属薄膜（Ｃｕ）、１５５は黒化層、２１０は透明なフィルム（電磁波遮蔽板用の基材）、２２０は接着剤、２３０は保護層である。ステンレス材からなる凹部をその一面に形成した基板１１０を準備した。（図２（ａ））メッシュ状の凹部を形成する基板として厚さ０．１５ｍｍのステンレス板（ＳＵＳ３０４材）を用いた。該ステンレス＊板面に重クロム酸カリウムを光感光剤とする水溶性のカゼインレジストを掛け流し塗布し、乾燥し、次いで、網目状のメッシュパターン（１００メッシュ、幅２８μｍ）を密着露光し、所定温度の水にて現像処理を行い基板面上にメッシュ状のレジストパターンを形成した後、これを２５０°Ｃでベーキング処理し、該レジストパターンをエッチング用マスクとして塩化第二鉄水溶液でエッチングしてステンレス板の一面に凹部を形成した。レジストの除去は、熱アルカリ液により行い、この後洗浄して、図２（ａ）に示す基板１１０を得た。

【００２１】次いで、Ｐｄ金属粉末をその中に分散混入させた、紫外線（ＵＶ光とも言う）硬化性のアクリル系樹脂を凹部１１５に埋め込み、凹部以外の部分についた樹脂はスキージ除去した。（図２（ｂ））

【００２２】次いで、基板１１０を凹部１１５側が、ポリエステル樹脂からなる透明なフイルム２１０と圧着した状態で、フィルム２１０側から光（紫外線）を照射し（図２（ｃ））、凹部１１５中の樹脂を硬化させるとともに、フィルム２１０側に、フィルム面に設けてある接着剤２２０を介して転移させた。（図２（ｄ））フィルムの厚さは０．１ｍｍとした。これにより、フィルム２１０面上に基板１１０の凹版形状にそった形状の、即ちメッシュ状の硬化樹脂部１２５が形成された。尚、樹脂のフィルムへの転写に先立ち、電磁波遮蔽板用の基材であるポリエステルの透明なフィルム２１０のメッシュ形成側面に、紫外線硬化性の接着剤２２０を予め約３０μｍの厚さに均一に塗布しておいた。紫外線硬化性の接着剤は、アクリレートモノマーと光重合開始剤を主成分とし、ここでは、アルリレートモノマーとして２－エチルキシルアクリレートや１．４－ブタンジオールアクリレートなどを用い、光重合開始剤として、ベンゾイルパーオキサイドを使用した。

【００２３】次いで、このフィルムを以下のめっき条件にて無電解銅めっきを行い、めっきからなる金属薄膜のメッシュを形成した。（図２（ｅ））

（めっき条件）

浴組成：	ＯＰＣ７５０Ｍ（奥野製薬工業株式会社製）
	ＯＰＣ７５０ＭＡ　１００ｍｌ／ｌ
	ＯＰＣ７５０ＭＢ　１００ｍｌ／ｌ
	ＯＰＣ７５０ＭＣ　２～５ｍｌ／ｌ
液温	５０°Ｃ
めっき速度	０．５μｍｉｎ
めっき膜厚	５μｍ
仕上がり線幅	３０μｍ

尚、無電銅界めっきに先き立ち、硬化した樹脂を過マンガン酸のアルカリ混合液でケミカルエッチングし、樹脂部（硬化樹脂１２５）に孔をあけた（ポーラスにした）状態にした。この後、シュウ酸にて中和しておいた。そして、その後、塩酸、硫酸等により樹脂内に分散混入されたＰｄ金属面を活性化してから無電界めっきを行った。樹脂部（硬化樹脂１２５）に孔をあけた（ポーラスにした）状態にして無電界めっきを行うため、図２（ｅ）、図２（ｆ）、図２（ｇ）のめっき部（金属薄膜１５０）は、樹脂部（硬化樹脂１２５）の内部にまで達

している。また、転写する際の接着剤層にメッキ阻害の材料（アミン、シリコーン等）を入れておくと、メッキの付着が不要な接着剤層表面部へのメッキ付着は阻止できる。

【００２４】次いで、めっき銅１５０の露出した部分を酸化して黒化層１５５を形成した。

（図２（ｆ））次いで、めっき銅１５０からなる金属薄膜メッシュが転移したポリエステルの透明なフィルム２１０の転写面に透明なアクリルの保護層２３０を、周辺の枠型銅部からのリード線引出し部を除く、メッシュ部を含む所定領域全面に形成して電磁波遮蔽板とした。

（図２（ｇ））

このようにして、電磁波遮蔽板を形成し、プラズマディスプレイ（ＰＤＰ）の前面におき、その電磁波遮蔽性を確認したが、所望通りの効果が得られた。尚、上記で凹部１１５が形成されたステンレス基板１１０は、再度反復して半永久的に用いることができた。

【００２５】（実施例２）実施例２は、図３に示す装置にて、電磁波遮蔽板用の基材である０．１ｍｍ厚のポリエステルからなる透明なフィルムに、実施例１にて凹部に充填した樹脂を転移させたものである。その他は実施例１と同様に行った。

【００２６】図３に示す装置の動作を簡単に説明する。先ず、実施例１と同様に樹脂を転移させる側に接着剤層を設けたフィルム３２０を２つの支持ロール３８０間に挟み供給する。次いで、フィルム３２０は、接着剤層側をロール凹版３１０側に向け、ロール凹版３１０と押圧ロール３７０間に挟まれた後、押圧ロール３７５とロール凹版（シリンダ凹版とも言う）３１０とに挟まれて引き出されるが、押圧ロール３７０と押圧ロール３７５間においては、両ロールにより、ロール凹版３１０の面に沿うように圧接される。一方、ロール凹版３１０の凹部３１５には、ノズル塗工装置３５０より樹脂３３０が凹部３１５を埋めるように塗布され、ドクター３９０にて凹部３１５以外についた樹脂３３０は除去されて、ロール凹版３１０の凹部３１５は押圧ロール３７０側に進む。即ち、凹部３１５のみに樹脂が充填された状態で、図の矢印の方にロール凹版３１０が回転する。ロール凹版３１０の回転とともに、押圧ロール３７０とロール凹版３１０との間にフィルム３２０を挟み、密着された状態で、更に押圧ロール３７５側に進むが、押圧ロール３７０と押圧ロール３７５間において、フィルム側から紫外線を照射して樹脂を硬化させる。樹脂の硬化により、硬化した樹脂３３５はフィルム３２０側に接着剤を介して転移する。この後、押圧ロール３７５を通り、フィルム３２０はロール凹版３１０と離れ、硬化した樹脂３３５をフィルム３２０に転移させた状態となる。

【００２７】このようにして得られた、硬化した樹脂３３５をロール凹版３１０から転移させたフィルム３２０を用い、帯状のまま、実施例１と同様に無電解めっきを行った後、所定の長さ、幅に切断して、所望の電磁波遮蔽板を得た。実施例１と同様の品質の電磁波遮蔽板を得ることができた。

【００２８】（実施例３）実施例３は、実施例１において、凹部に充填する樹脂として、Ｐｄ、Ｎｉ、ＰｄＣｌ２等、触媒となる金属ないし金属化合物を含有しない水浸透性を有すＰＶＡを用い、これを転写した後、樹脂分中に、触媒となるＰｄを含有させて無電界めっきを施したものである。他は実施例１と同様に行い、実施例１と同様の品質の電磁波遮蔽板を得ることができた。以下、転写後に、樹脂分中に、触媒となるＰｄを含有させて無電界めっきを行った処理を簡単に説明しておく。先ず、転写後、塩化第一錫溶液に、樹脂部（硬化樹脂１２５）をディッピングし、樹脂部中に塩化第一錫を含浸させた。次いで、水洗後、塩化パラジウム溶液に、樹脂部（硬化樹脂１２５）を入れ、樹脂部中にＰｄ（パラジウム）を析出させた。これにより、結果、Ｐｄが樹脂部中に析出されたこととなる。この後、樹脂部中のＰｄを触媒として、無電界めっきを行った。

【００２９】

【発明の効果】本発明は、上記のように、ＰＤＰ等のディスプレイの前面に置いて用いられる、透明なフィルムの一面に金属薄膜からなるメッシュを積層した電磁波遮蔽性と透視性を有する電磁波遮蔽板の製造方法で、品質的にも十分対応でき、且つ、生産性の良い製造方法の提供を可能としている。

【図面の簡単な説明】

【図１】本発明の電磁波遮蔽板の製造方法の実施の形態の１例を示した工程フロー図

【図２】実施例１の工程を説明するための一部断面図

【図３】実施例２のフィルムへの樹脂の転移を行う装置概略断面図

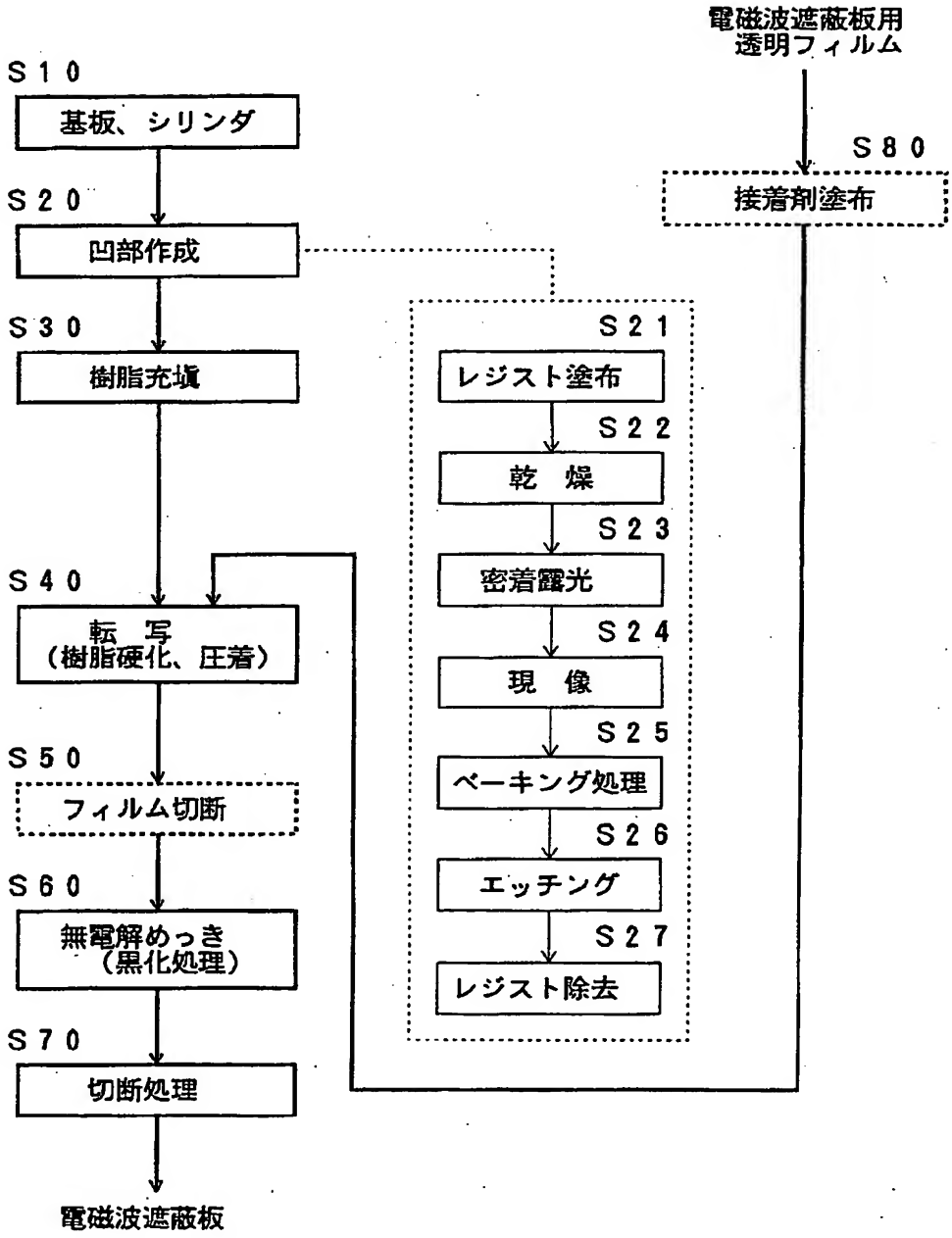
【図４】金属薄膜からなるメッシュを用いた電磁波遮蔽板を説明するための図

【符号の説明】

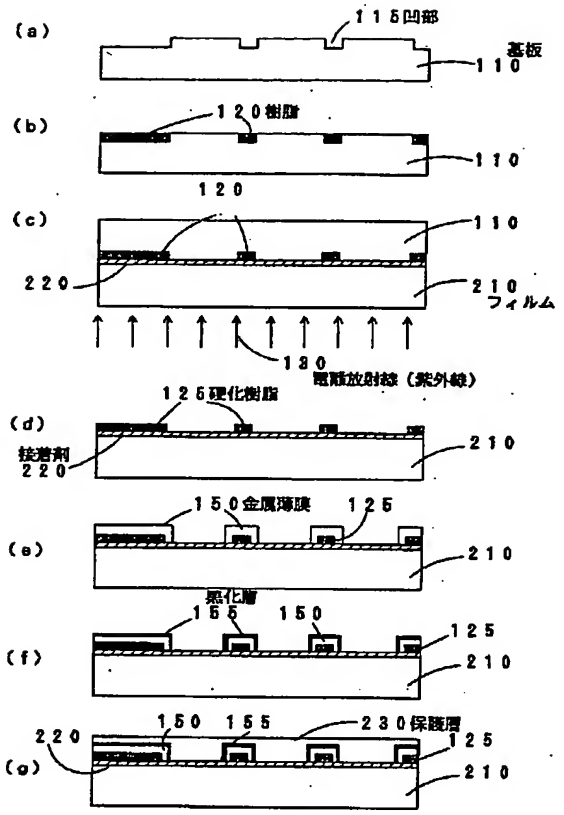
１１０	基板（ステンス基板）
１１５	凹部
１２０	樹脂
１２５	硬化樹脂
１３０	電離放射線（紫外線）
１５０	無電解めっき銅
１５５	黒化層
２１０	（電磁波遮蔽板用の）透明なフィルム
２２０	接着剤
２３０	保護層
３１０	ロール凹版（シリンダ凹版）
３２０	フィルム
３３０	樹脂
３３５	硬化樹脂

３５０	ノズル塗工装置	＊４００	電磁波遮蔽板
３６０	紫外線照射装置	４１０	メッシュ部
３６５	紫外線	４１５	接地用枠部
３７０、３７５	押圧ロール	４１７	金属薄膜
３８０	支持ロール	４３０	透明基板
３９０	ドクター	＊　４５０、４７０	ライン

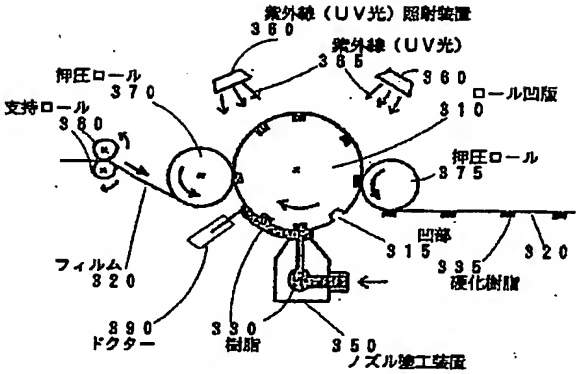
【図１】



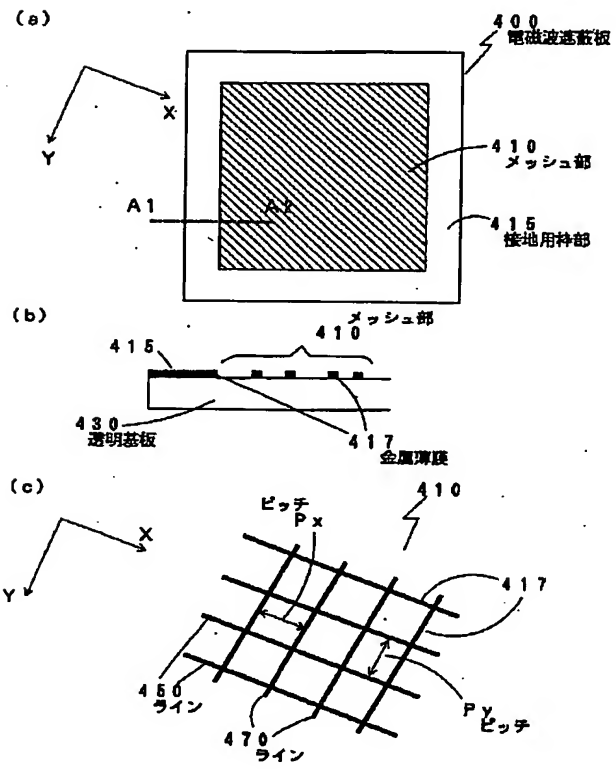
【図２】


(a)
１１５凹部
基板
１１０
(b)
１２０樹脂
１１０
１２０
(c)
１１０
２２０
２１０
フィルム
１３０
電離放射線（紫外線）
(d)
１２５硬化樹脂
接着剤
２２０
２１０
(e)
１５０金属薄膜
１２５
２１０
黒化層
１５５
１５０
(f)
１２５
２１０
１５０
１５５
２３０保護層
２２０
１２５
(g)
２１０

【図３】


紫外線（ＵＶ光）照射装置
３６０
紫外線（ＵＶ光）
３６５
３６０
押圧ロール
３７０
ロール凹版
３１０
支持ロール
３８０
押圧ロール
３７５
凹部
３１５
３９５
硬化樹脂
３２０
フィルム
３２０
３９０
ドクター
３３０
樹脂
３５０
ノズル塗工装置

【図４】


(a)
４００
電磁波遮蔽板
X
Y
４１０
メッシュ部
A1
A2
４１５
接地用枠部
(b)
メッシュ部
４１０
４１５
４３０
透明基板
４１７
金属薄膜
(c)
４１０
ピッチ
Px
X
Y
４１７
４５０
ライン
Py
ピッチ
４７０
ライン